CLAIMS:

1. A process for synthesising hydrocarbons, which process includes

feeding a gaseous feedstock comprising hydrogen, carbon monoxide and carbon dioxide, into a dimethyl ether (DME) synthesis stage, the gaseous feedstock having a syngas number (SN) between 1.8 and 2.2, where

$$SN = \frac{[H_2] - [CO_2]}{[CO] + [CO_2]}$$

and where $[H_2]$, $[CO]$ and $[CO_2]$ respectively are the molar proportions of hydrogen, carbon monoxide and carbon dioxide in the gaseous feedstock;

in the DME synthesis stage, converting a portion of the gaseous feedstock into a DME product and gaseous products;

separating the DME product from unreacted gaseous reactants and the gaseous products to obtain a tail gas comprising hydrogen and carbon monoxide and carbon dioxide;

recycling a portion of the tail gas from the DME synthesis stage to the DME synthesis stage, a ratio of tail gas recycle to gaseous feedstock being between about 0 : 1 and about 2 : 1;

feeding the tail gas into a Fischer-Tropsch hydrocarbon synthesis stage, which is a two-phase high temperature catalytic Fischer-Tropsch hydrocarbon synthesis stage; and

allowing the hydrogen, carbon monoxide and carbon dioxide at least partially to react catalytically in the Fischer-Tropsch hydrocarbon synthesis stage to form hydrocarbons, the hydrocarbons formed in the Fischer-Tropsch hydrocarbon synthesis stage thus being gaseous hydrocarbons at the operating pressure and temperature of the Fischer-Tropsch hydrocarbon synthesis stage.

2. The process as claimed in claim 1, in which converting a portion of the gaseous feedstock into a DME product and gaseous products includes contacting the gaseous feedstock with a catalyst or catalysts that enhance methanol synthesis and methanol dehydration reactions.

3. The process as claimed in claim 1 or claim 2, in which the DME product includes a mixture of DME and methanol and which includes converting the DME product into light olefins in a light olefins production stage without increasing the DME concentration in the DME product.

4. The process as claimed in any one of the preceding claims, in which the DME synthesis stage is operated at a pressure of between about 50 bar(g) and about 100 bar(g) to ensure that overall CO + CO_2 conversion in the DME synthesis stage is between about 20 % and about 80 %.

5. The process as claimed in any one of the preceding claims, which includes recycling some of the Fischer-Tropsch hydrocarbon synthesis stage tail gas to the Fischer-Tropsch hydrocarbon synthesis stage, to obtain high overall CO + CO_2 conversions in the Fischer-Tropsch hydrocarbon synthesis stage of at least 80 %.

6. The process as claimed in any one of the preceding claims, which includes recycling some of the Fischer-Tropsch hydrocarbon synthesis stage tail gas to the Fischer-Tropsch hydrocarbon synthesis stage, a ratio of Fischer-Tropsch tail gas recycle to the tail gas from the DME synthesis stage fed to the Fischer-Tropsch hydrocarbon synthesis stage being between 2.5 : 1 and 1 : 1.5.

7. The process as claimed in claim 3, which includes, in a separation stage, separating light hydrocarbons from the Fischer-Tropsch hydrocarbon synthesis stage tail gas and converting these light hydrocarbons, together with the DME product, into light olefins with a carbon number from 2 to 4 in the light olefins production stage.

8. The process as claimed in claim 3 or claim 7, in which gaseous hydrocarbons and any unreacted hydrogen, unreacted carbon monoxide, and CO_2 are withdrawn from the Fischer-Tropsch hydrocarbon synthesis stage, and separated into one or more condensed liquid hydrocarbon streams, a reaction water stream and a Fischer-Tropsch hydrocarbon synthesis stage tail gas, the process further including treating the condensed liquid hydrocarbons from the Fischer-Tropsch hydrocarbon synthesis stage, to provide a light hydrocarbon fraction, including naphtha, which is converted, together

with the DME product, in the light olefin production stage to light olefins, and to provide a diesel fraction.

9. The process as claimed in claim 3 or claim 7 or claim 8, which includes using separation equipment to recover C_2-C_4 light olefins from the Fischer-Tropsch hydrocarbon synthesis stage and in which C_2-C_4 light olefins from the light olefins production stage are recovered using the same separation equipment that is used to recover the C_2-C_4 light olefins produced by Fischer-Tropsch synthesis.

10. The process as claimed in any one of the preceding claims, in which the two-phase high temperature catalytic Fischer-Tropsch Hydrocarbon synthesis stage employs an iron catalyst.